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Some Characteristics of the Surface Temperature of Urban Facilities Using by the Infrared Thermometer

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Synopsis: The surface temperature of urban facilities, such as walls of buildings, road pavements, road-side lands, tree leaves and so on, were measured during for each whole day(24 hour) in three seasons by the infrared thermometer. The daily or seasonal change of surface temperature and the difference among facilities were analyzed. By these analyzes some interesting results concerned to characteristics of the surface temperature were obtained.

Keywords: *surface temperature, infrared energy, insolation, energy assumption*

1. Introduction

Now we are in heat-island phenomenon, which means that some urban areas have been warming, because of more population and more assumption of energy. This phenomenon becomes more serious related to the global environment problems.

In this study, we measured and analyzed many data by using the infrared thermometer, in order to investigate the characteristics of changing surface temperature of urban facilities under any factors, such as, kinds of facilities, daily and seasonal circumstances and so on.

2. Measurements

In order to analyze the characteristics of surface temperature, the data of many points and time should be measured. Then we used the infrared thermometer which can measure the surface temperature sensitively by converting the infrared energy into the electric signal. By using this thermometer, we can get the temperature data as a thermo-picture, quickly and exactly. However it will be necessary to consider that some errors related to circumstances and measurements will be included in these data.

Four major facilities such as road surface, leaves of tree, grand and wall of building were selected to analyze the differences of physical characteristics.

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3. Characteristics of Surface Temperature

3.1 Daily Change

The surface temperature of each facility seems to be changed by some conditions, especially the degree of insolation closely related with weather. Then we try to analyze the daily change of surface temperature for tree facing east with some different conditions. Figure 1 shows an example of results. According to this results, we can understand that the higher the surface temperature becomes, the higher the degree of insolation becomes in the morning. And the atomosphic temperature also shows the same trend of changes.

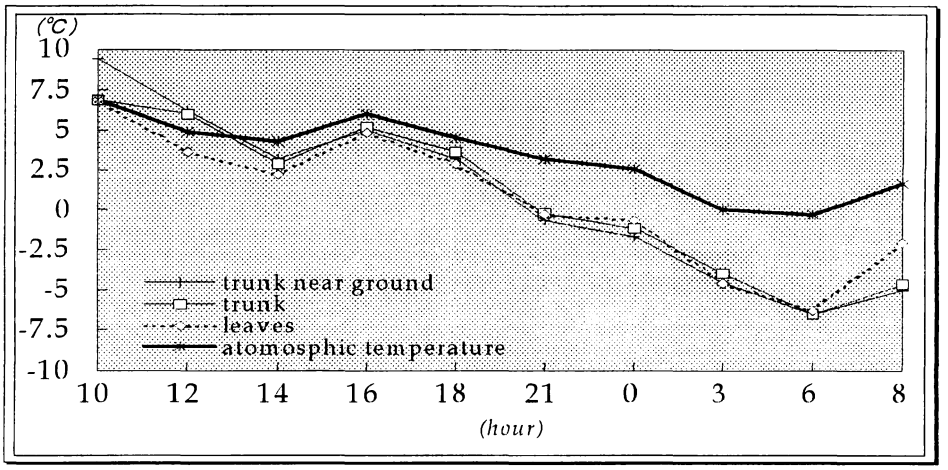


Fig. 1 Change of surface temperature of tree facing for east on February

3.2 Seasonal Change

There are also some differences between the temperature in seasons. **Figure 2** shows comparison of seasonal differences of road surface temperature through the data observed in February and September. In this figure, we can find an interesting result that the surface temperature in higher than the atomosphic on in September as against lower in February.

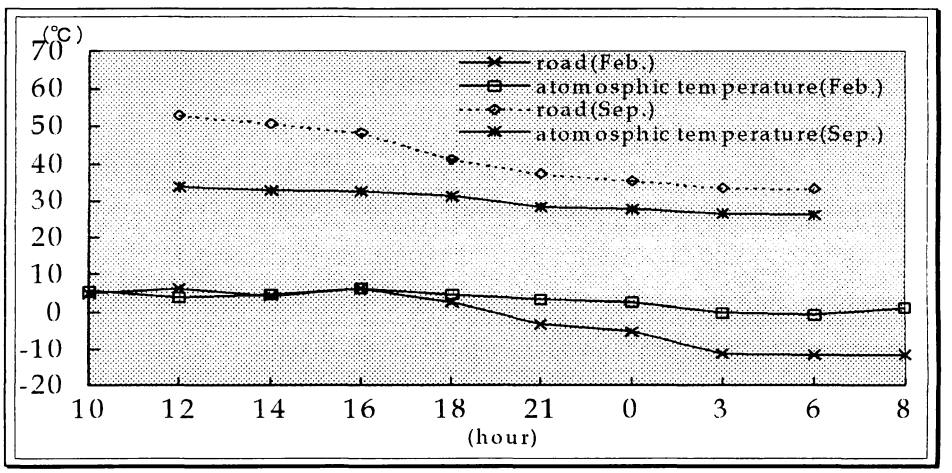
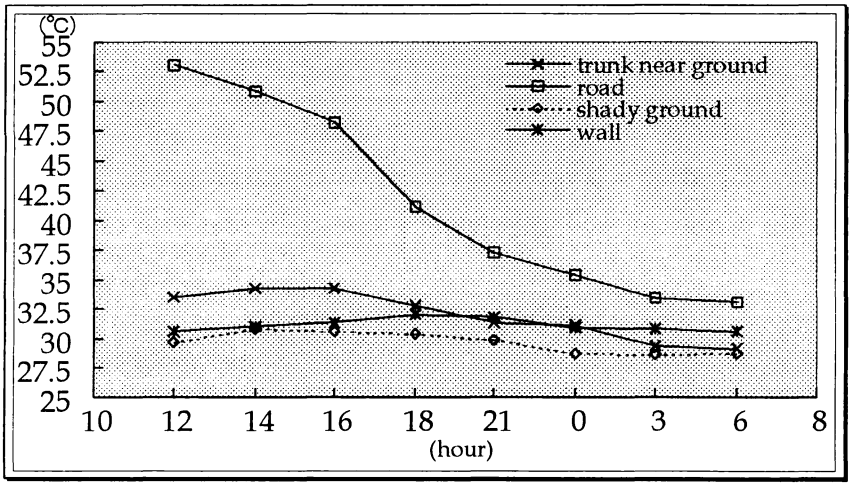


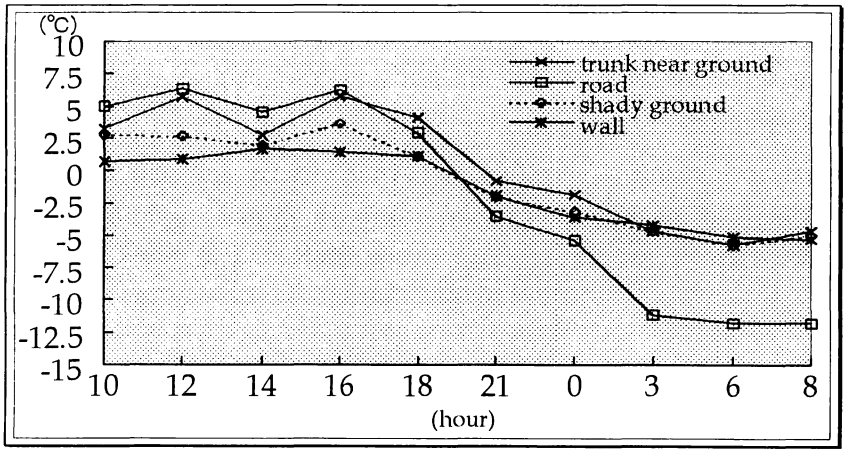
Fig. 2 Comparison of seasonal differences of road surface temperature (observed in February and September)

3.3 Differences among facilities

The trend of daily change of surface temperature by each facility are different as shown **Fig. 3** Especially the change of artificial facilities such as road and building is more notable than one of natural facilities. Furthermore, from this figure it seems that the tree-planing area absorbs the heat of surroundings in September as against radiates in February.



[observed in September]



[observed in September]

Fig. 3 Comparison of each facility's temperature

3.4 Influence of Artificial Heat to Surface Temperature

Generally, the surface temperature of building wall is influenced by the heat source in building such as lights, air-conditioner. From **Figure 4,** the air-conditioner in use or not seems to influence to the surface temperatures, because the degree of change is notable in daytime in winter.

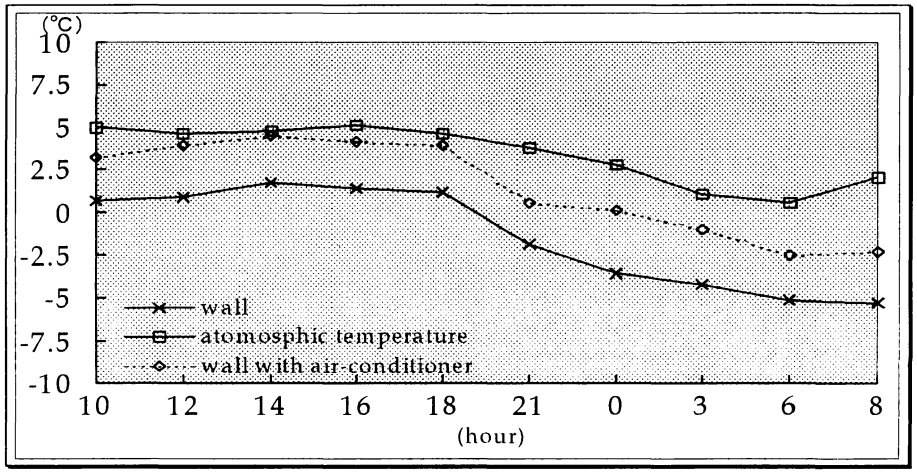


Fig. 4 Change of wall temperature influenced by heat source on February

4. Summary and Problems

In this study, the surface temperature of some facilities were observed and analyze under a couple of conditions. These results will be summarized as follows.

1. The surface temperature is sensitively change corresponding to the change of weather, because it is mainly influenced by the degree of insolation.
2. The higher the surface temperature becomes, the higher the degree of insolation becomes in the morning.
3. The surface temperature in higher than the atomosphic on in September as against lower in February.
4. The change of artificial facilities such as road and building is more notable than one of natural facilities.
5. The air-conditioner in use or not seems to influence to the surface temperatures.

The surface temperature is changeable by the conditions of measurements. However, now we have not so much data to analyze such changes. Therefore we have to observe and analyze further more data in wider areas including the kinds of land-use and facilities in order to make clear the characteristics of surface temperature.